

Variations for Biomass, Economic Yield and Harvest Index among Soybean Cultivars of Maturity Groups III and IV in Argentina

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Introduction

In the southern pampeana region of Argentine, south of the parallel 36° Latitude S, soybean (*Glycine max* (L.) Merr.) crop is grown on approximately 200.000 hectares with further expansion expected. Cultivars of maturity Groups III and IV are well adapted to this zone. Identify plant traits that contribute to crop productivity is essential for developing high yielding cultivars (Salman and Brinkman, 1992). Harvest index (HI), defined as ratio between economic yield (EY) and the total biomass i.e biological yield (BY), influences EY more than any other yield determining plant trait (Bhardwaj and Bhagsari, 1989). Donald and Hamblin (1976) have reviewed the history of the concept of HI and concluded that it may be used as a criterion for yield evaluations. Soybean economic yield was reported to be correlated with HI (Bhardwaj and Bhagsari, 1989). Cultivars with high HI should be combined with cultivars having high biomass to increase yield (McVetty and Evans, 1980). The values of HI in soybean (*Glycine max* (L.) Merrill) range between 0.47 and 0.56, with absence of water stress (Hume et al., 1989). Twenty-one soybean genotypes of maturity group IV and six of maturity group III were evaluated under two different conditions of humidity with the following objectives: a) determine variability for EY, BY and HI among soybean cultivars, b) identify genotypes having high BY, EY and HI and c) determine the associations between BY and HI with EY in order to enhance soybean grain yields combining superior genotypes for BY and HI.

Materials and Methods

Trials were carried out at two sites in the southern pampeana region, Balcarce irrigated (Balcarce 1) and Balcarce rain fed (Balcarce 2). Average rainfall during the crop season is 360.0 mm approximately. The summer of 1998-99 was characterized by a severe drought and the rainfall was: 245.3 mm. At Balcarce 1 the crop was supplied throughout the growing season by aspersion irrigation in three occasions (December: 30mm, January: 110mm, February: 15mm) with 155mm at total. At the two sites soils were Argiudoll typical. The trials included twenty- seven indeterminate commercial cultivars supplied by different seed companies. Each trial was arranged as a randomized block design, with three replications. Plots were four rows wide, with 0.7 m row spacing and 5 m long. Plots were sown at a plant density of 23 seeds m⁻². Sowing dates were December 2 at Balcarce 1 and November 17 at Balcarce 2. Weeds were controlled by chemical and mechanical methods according to the species present at each location. No insecticides or fungicides were used. The two central rows were harvested for yield evaluation with combine harvester. Harvest dates were May 20 at Balcarce 1 and May 15 at Balcarce 2. Plants from one-meter row length were cut at 0.1 m above ground level and dried in an oven at 45 °C for 14 hours, weighed after drying, threshed and seed weighed. Harvest index was calculated as Weight of seed/ Total weight of unthreshed plants. Economic and biological yields were expressed as t ha⁻¹, at 87% of dry matter. Data of EY, BY and HI, were subjected to analysis of variance.

Results and Discussion

The results (Table 1) showed that the adjusted means of EY, HI and BY of all cultivars combined across the two environments were 2.49 t ha⁻¹, 0.44 and 5.35 t ha⁻¹ respectively. The averages of EY, BY and HI (all cultivars combined) were 3.10 t ha⁻¹, 6.11 t ha⁻¹ and 0.51 respectively for Balcarce 1 and 1.96 t ha⁻¹, 4.8 t ha⁻¹ and 0.41 respectively for Balcarce 2. Analysis of variance across environments indicated significant differences ($P < 0.05$) among environments and cultivars for EY, BY and HI and significant cultivar x environment interaction only for EY. The cultivars with the highest EY, at Balcarce1, were Delia and DM 48 both from MG IV. The cultivars with the highest EY, at Balcarce 2, were all from MG IV and among them the highest yields were ACA 490 and Bonaerense. The cultivars with the highest HI across the environments were Delia, DM 48, Dorada and Joketa 46, and those with the highest BY belonged to MG IV (A 4501 RG, HM5-41, P94B41,

A4100RG) or to a long MGIII (DM 3800RR and A 3910) as was reported by Rao and Bhagsari, 1998. The simple correlations between BY and HI with EY were 0.59 ($P < 0.01$) and 0.31 ($P < 0.05$) for the two environments respectively.